

Metric Conversion Tables

Table 1-1M System Kilometers Within the United States (Statute kilometers)

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998
Highway ^a	5,706,240	5,937,942	6,002,985	6,176,897	6,211,806	6,218,364	6,223,214	6,296,117	6,307,743	6,348,214	6,355,127
Class I rail ^{b,c}	333,672	321,544	316,202	308,222	265,255	234,584	192,732	174,234	170,235	164,359	161,852
Amtrak ^c	N	N	N	N	38,624	38,624	38,624	38,624	40,234	40,234	35,406
Transit ^d											
Commuter rail ^c	N	N	N	N	N	5,752	6,649	6,695	5,926	7,108	8,324
Heavy rail	N	N	N	N	N	2,081	2,174	2,346	2,379	2,457	2,457
Light rail	N	N	N	N	N	618	777	913	1,027	1,061	1,088
Navigable channels ^e	40,234	40,234	41,843	41,843	41,843	41,843	41,843	41,843	41,843	^R 41,843	41,843
Oil pipeline ^f	307,295	339,358	351,917	363,533	351,469	343,764	335,954	^R 356,631	^R 285,715	^R 289,478	287,506
Gas pipeline ^g	1,015,416	1,235,204	1,469,761	1,575,971	1,692,666	1,800,655	1,942,308	2,031,237	2,054,030	^R 2,013,610	2,059,500

KEY: N = data do not exist; R = revised

- ^a All public road and street mileage. Prior to 1980, some miles of nonpublic roadways are included. No consistent data on private road mileage are available. Includes District of Columbia.
- ^b Data represent miles of road owned (aggregate length of road, excluding yard tracks, sidings, and parallel lines).
- ^c Portions of Class I freight railroads, Amtrak, and commuter rail networks share common trackage. Amtrak data represent miles of track operated.
- ^d Transit system mileage is measured in directional route-miles. A directional route-mile is the mileage in each direction over which public transportation vehicles travel while in revenue service. Directional route-miles are computed with regard to direction of service, but without regard to the number of traffic lanes or rail tracks existing in the right-of-way.
- ^e The St. Lawrence Seaway is not included in this number because 3 of the 5 subsections are solely in Canadian waters, and the others are in international boundary waters. Of the 26,000 miles of navigable waterways, 10,867 miles are commercially significant shallowdraft inland waterways subject to fuel taxes.
- ^f Includes trunk and gathering lines for crude-oil pipeline.
- ^g Excludes service pipelines. Data not adjusted to common diameter equivalent. Mileage as of the end of each year. Includes field and gathering, transmission, and distribution main. See table 1-8 for a more detailed breakout of oil and gas pipeline mileage.
- NOTE:** Total highway mileage in this table will not match that in tables 1-3 and 1-4 because of a change in the way the U.S. Department of Transportation, Federal Highway Administration (FHWA) creates mileage-based tables derived from the Highway Performance Monitoring System, beginning with the 1997 issue of FHWA's *Highway Statistics*.

SOURCES:

Highway: 1960-95: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995*, FHWA-PL-97-009 (Washington, DC: Annual issues), table HM-212.
1996-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table HM-12.

Class I rail: 1960-98: Association of American Railroads, *Railroad Facts* (Washington, DC: 1998), p. 44.

Amtrak: 1980: Amtrak, Corporate Planning and Development, personal communication (Washington, DC).
1985-98: Amtrak, Corporate Planning and Development, *Statistical Appendix to Amtrak Annual Report* (Washington, DC: Annual issues).

Transit: U.S. Department of Transportation, Federal Transit Administration, *National Transit Database* (Washington, DC: Annual issues), table 18 (1996-1997) and table 19 (for 1998) and similar tables in earlier editions.

Navigable channels: 1960-96: U.S. Army Corps of Engineers, Ohio River Division, Huntington District, *Ohio River Navigation System Report, 1996, Commerce on the Ohio River and its Tributaries* (Fort Belvoir, VA: 1996), p. 2.
1997-1998: Waterborne Commerce Statistics Center Databases, personal communication, June 2000.

Oil pipeline: 1960-98: Eno Transportation Foundation, Inc., *Transportation in America, 1998* (Washington, DC: 1999), p. 64.

Gas pipeline: 1960-98: American Gas Association, *Gas Facts* (Arlington, VA: Annual issues), table 5-2 and similar tables in earlier editions.

Table 1-6M Estimated U.S. Roadway Lane-Kilometers by Functional System^a

	1980	1985	1990	1991	1992	1993	1994	1995	1996	1997 ^R	1998 ^R	1999
Urban												
Interstates	77,986	92,207	100,124	101,109	108,254	111,341	113,993	114,870	115,535	117,427	118,655	119,153
Other arterials	536,995	598,111	642,733	647,536	673,041	700,686	712,093	717,491	723,368	733,655	734,397	728,433
Collectors	233,561	261,320	270,000	266,005	283,465	289,123	295,078	297,780	300,823	306,022	303,928	301,932
Local	1,396,888	1,530,515	1,675,546	1,693,477	1,765,643	1,801,744	1,817,300	1,831,224	1,849,870	1,897,301	1,911,925	1,926,427
Total	2,245,429	2,482,154	2,688,403	2,708,127	2,830,403	2,902,894	2,938,464	2,961,365	2,989,596	3,054,405	3,068,905	3,075,944
Rural												
Interstates	210,792	212,284	218,663	219,680	214,794	212,655	211,252	212,298	213,983	214,308	215,073	216,635
Other arterials	816,095	820,773	832,581	833,339	847,664	846,364	852,659	854,089	857,549	865,618	867,235	869,381
Collectors ^a	2,303,401	2,360,568	2,361,876	2,361,810	2,319,815	2,308,561	2,304,885	2,281,129	2,279,896	2,287,792	2,283,229	2,280,379
Local	7,173,786	7,027,931	6,855,435	6,893,084	6,861,779	6,817,027	6,797,650	6,820,554	6,821,243	6,891,559	6,748,873	6,768,836
Total	10,504,074	10,421,557	10,268,556	10,307,914	10,244,052	10,184,606	10,166,447	10,168,070	10,172,671	10,259,277	10,114,410	10,135,232
TOTAL												
lane-kilometers	12,749,503	12,903,711	12,956,959	13,016,041	13,074,455	13,087,501	13,104,911	13,129,436	13,162,268	13,313,681	13,183,315	13,211,176

^a Includes the 50 States, the District of Columbia, and Puerto Rico^b Includes minor and major collectors.

NOTE: In estimating rural and urban lane mileage, the U.S. Department of Transportation, Federal Highway Administration assumed that rural minor collectors and urban/rural local roads are two lanes wide.

SOURCES: 1980-95: U.S. Department of Transportation, Federal Highway Administration, Office of Highway Information Management, table HM-260 (unpublished).

1996: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table HM-60.

1997-99: Ibid., Internet site www.fhwa.dot.gov/ohim.ohimstat.htm, as of Nov. 15, and Dec. 8, 2000.

KEY: R = revised

Table 1-29M

U.S. Vehicle-Kilometers (Millions)

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998
Air											
Air carrier, large certificated, domestic, all services	1,381	1,825	3,328	3,135	4,060	4,902	6,378	7,450	7,743	^R 7,904	8,097
General aviation ^a	2,847	4,123	5,161	6,820	8,375	7,520	7,319	6,107	5,671	6,239	U
Highway^R											
Passenger car ^{b,c}	944,706	1,163,069	1,475,288	1,663,984	1,788,944	2,006,531	2,266,389	2,298,947	2,347,942	2,401,910	2,487,782
Motorcycle ^b	^h	^h	4,794	9,059	16,438	14,623	15,381	15,767	15,953	16,224	16,512
Other 2-axle 4-tire vehicle ^c	^h	^h	198,410	322,996	468,215	629,192	924,684	1,271,431	1,313,124	1,369,134	1,394,061
Truck											
Single-unit 2-axle 6-tire or more truck	158,603	207,234	43,583	55,693	64,073	73,130	83,527	100,914	103,006	107,654	109,265
Combination truck	46,436	50,960	56,543	75,195	110,527	125,630	151,827	185,801	191,245	200,499	206,252
Bus	6,994	7,533	7,313	9,745	9,751	7,207	9,215	10,332	10,522	11,011	11,259
Total highway^c	1,156,739	1,428,796	1,785,931	2,136,672	2,457,948	2,856,313	3,451,023	3,883,192	3,981,793	4,106,432	4,208,615
Transit											
Motor bus ^d	2,537	2,460	2,268	2,456	2,699	2,998	3,428	3,515	3,574	^R 3,613	^P 3,687
Light rail	120	67	54	38	28	27	39	56	61	66	^P 69
Heavy rail	629	636	655	681	619	725	864	864	874	898	^P 911
Trolley bus	162	69	53	25	21	25	22	23	23	23	^P 23
Commuter rail	N	N	N	278	288	295	343	383	389	404	^P 426
Demand responsive ^d	N	N	N	N	N	398	492	816	882	^R 941	^P 1,123
Ferry boat	N	N	N	N	^I	^I	4	5	5	3	3
Other	N	N	N	24	25	24	^R 29	^R 60	^R 72	^R 84	85
Total transit^e	3,449	3,232	3,030	3,502	3,681	4,492	^R5,218	5,713	5,874	^R6,029	^P6,328
Rail											
Class I freight, train-kilometers	650	678	687	649	689	558	612	737	754	764	764
Class I freight, car-kilometers	45,335	47,212	48,103	44,508	47,117	40,105	42,099	48,897	51,040	50,952	52,556
Intercity/Amtrakf, train-kilometers	336	277	150	48	48	48	53	51	48	51	53
Intercity/Amtrakf, car-kilometers	3,554	2,857	1,110	407	378	404	484	470	444	463	502
Total train-kilometers^g	987	954	837	697	737	607	665	789	803	816	818

KEY: N = data do not exist; P = preliminary;
R = revised; U = data are not available

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Table 1-29M
Cont'd**U.S. Vehicle-Kilometers (Millions)**

- ^a All operations other than those operating under 14 CFR 121 and 14 CFR 135. Data for 1996 are estimated using new information on nonrespondents and are not comparable to earlier years. Mileage in source is multiplied by 1.151 to convert to nautical-miles for 1985-1997, data is then converted to kilometers.
- ^b U.S. Department of Transportation, Federal Highway Administration (FHWA), provides data separately for passenger car and motorcycle in its annual Highway Statistics series. However, the 1995 summary report provides updated data for passenger car and motor cycle combined. Passenger car figures in this table were computed by U.S. Department of Transportation, Bureau of Transportation Statistics by subtracting the most current motorcycle figures from the aggregate passenger car and motorcycle figures.
- ^c In July 1997, the FHWA published revised vehicle-kilometers data for the highway modes for many years. The major change reflected the reassignment of some vehicles from the passenger car category to the other 2-axle 4-tire vehicle category.
- ^d Motor bus and demand responsive figures are also included in the bus figure for highway.
- ^e Prior to 1985, excludes demand response and most rural and smaller systems funded via Sections 18 and 16(b)2, Federal Transit Act. The series is not continuous between 1980 and 1985. Transit rail modes are measured in car-kilometers. Car-kilometers measure individual vehicle-kilometers in a train. A 10-car train traveling 1 kilometer would equal 1 train-kilometer and 10 car-kilometers. Motor bus and demand response figures are also included in the bus figure for highway.
- ^f Amtrak began operations in 1971.
- ^g Although both train-kilometers and car-kilometers are shown for rail, only train-kilometers are included in the total. A train-kilometer is the movement of a train, which can consist of multiple vehicles (cars), the distance of 1 kilometer. This differs from a vehicle-kilometer, which is the movement of 1 vehicle the distance of 1 kilometer. A 10-vehicle train traveling 1 kilometer would be measured as 1 train-kilometer and 10 vehicle-kilometers. Caution should be used when comparing train-kilometers with vehicle kilometers.
- ^h 1960-65, motorcycle data are included in passenger car, and other 2-axle 4-tire vehicle data included in single-unit 2-axle 6-tire or more truck.
- ⁱ Ferry boat included with other.

SOURCES:**Air:**

Air carrier: 1960: Civil Aeronautics Board, *Handbook of Airline Statistics 1969* (Washington, DC: 1970), part III, table 2.

1965-70: Ibid., *Handbook of Airline Statistics 1973* (Washington, DC: 1974), part III, table 2.

1975-80: Ibid., *Air Carrier Traffic Statistics* (Washington, DC: 1976, 1981), p. 4 (December 1976) and p. 2 (December 1981).

1985-98: U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information, *Air Carrier Traffic Statistics* (Washington, DC: Annual December issues), p. 2, line 27 plus line 50.

General aviation: 1960-65: U.S. Department of Transportation, Federal Aviation Administration, *FAA Statistical Handbook of Aviation 1972* (Washington, DC: 1973), table 9.10.

1970-75: U.S. Department of Transportation, Federal Aviation Administration, *FAA Statistical Handbook of Aviation 1976* (Washington, DC: 1976), table 8-5.

1980: U.S. National Transportation Safety Board estimate, personal communication, Dec. 7, 1998.

1985-90: Ibid., *General Aviation Activity and Avionics Survey* (Washington, DC: Annual issues), table 3.3.

1995-97: Ibid., *General Aviation and Air Taxi Activity and Avionics Survey* (Washington, DC: Annual issues), table 3.3.

Highway:

Passenger car and motorcycle: 1960-90: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995* (updated June 1999), Internet site <http://www.fhwa.dot.gov/ohim/summary95/index.html>, as of July 28, 2000, table VM-201A.

1995-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1, sum of passenger car and motorcycle.

Motorcycle: 1970-80: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics, Summary to 1985* (Washington, DC: 1986), table VM-201A.

1985-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

Other 2-axle 4-tire vehicle: 1970-90: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995* (updated June 1999), Internet site <http://www.fhwa.dot.gov/ohim/summary95/index.html>, as of July 28, 2000, table VM-201A.

1995-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

Single-unit 2-axle 6-tires or more truck, combination truck, and bus: 1960-90: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995* (updated June 1999), Internet site <http://www.fhwa.dot.gov/ohim/summary95/index.html>, as of July 28, 2000, table VM-201A.

1995-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

Transit:

1960-98: American Public Transit Association, *Public Transportation Fact Book* (Washington, DC: 2000), table 42, 84, and similar tables in earlier editions.

Rail:

Class I rail freight train- and car-miles: 1960-98: Association of American Railroads, *Railroad Facts, 1998* (Washington, DC: 1999), p. 33 (train-miles) and p. 34 (car-miles).

Intercity/Amtrak train-miles: 1960-70: Association of American Railroads, *Yearbook of Railroad Facts* (Washington, DC: 1975), p. 39.

1975-98: Amtrak, *Amtrak Annual Report*, Statistical Appendix (Washington, DC: Annual issues).

Intercity/Amtrak car-miles: 1960-75: Association of American Railroads, *Yearbook of Railroad Facts* (Washington, DC: 1975), p. 40.

1980-98: Amtrak, Amtrak Corporate Reporting, Route Profitability System, personal

Table 1-30M**Roadway Vehicle-Kilometers Traveled (VKT) and VKT per Lane-Kilometer by Functional Class**

	1980	1985	1990	1995	1996	1997	1998
VKT (millions)							
Urban							
Interstate	259,494	^R 347,922	448,848	^R 549,616	^R 565,813	^R 581,571	602,551
Other arterials ^a	^R 779,228	^R 930,637	^R 1,125,309	^R 1,311,782	^R 1,343,198	^R 1,362,467	1,387,975
Collector	133,645	144,162	^R 171,069	^R 204,199	^R 208,105	209,957	210,601
Local	^R 204,051	257,595	^R 307,471	^R 331,376	^R 335,346	^R 357,314	361,046
Total	^R1,376,418	^R1,680,316	^R2,052,696	^R2,396,973	^R2,452,461	^R2,511,309	2,562,172
Rural							
Interstate	217,397	248,414	^R 322,148	^R 359,499	^R 374,278	^R 386,438	404,046
Other arterials ^a	^R 422,895	^R 455,128	^R 532,478	^R 593,197	^R 609,696	^R 630,029	649,505
Collector ^b	^R 304,920	332,602	^R 386,984	^R 380,044	^R 387,901	^R 408,464	415,323
Local	136,318	^R 139,851	^R 156,717	169,245	^R 176,256	184,288	194,081
Total	^R1,081,529	^R1,175,995	^R1,398,326	^R1,501,986	^R1,548,131	^R1,609,218	1,662,954
VKT per lane-kilometer (thousands)							
Urban							
Interstate	^R 3,327	^R 3,773	^R 4,483	^R 4,785	^R 4,902	^R 5,005	5,140
Other arterials ^a	^R 1,451	^R 1,556	^R 1,751	^R 1,828	^R 1,855	^R 1,868	1,899
Collector	^R 572	^R 552	^R 634	^R 686	^R 687	^R 693	698
Local	^R 146	^R 168	^R 184	^R 181	292	^R 190	191
Total	^R613	^R677	^R764	^R809	^R819	^R830	842
Rural							
Interstate	^R 1,031	^R 1,170	^R 1,473	^R 1,693	^R 1,748	^R 1,803	1,885
Other arterials ^a	^R 518	^R 555	^R 640	^R 695	1,144	^R 729	750
Collector ^b	^R 132	^R 141	^R 164	^R 167	274	^R 179	182
Local	^R 19	^R 20	^R 23	^R 25	^R 25	^R 27	29
Total	^R103	^R113	^R136	^R148	245	^R157	165

^a For urban: the sum of other freeways and expressways, other principal arterials, and minor arterials. For rural: they represent the sum of other principal arterials and minor arterials.

^b Collector is the sum of major and minor collectors (rural only).

NOTE: See table 1-5M for estimated highway lane-kilometers by functional class.

SOURCES:

Vehicle-kilometers: 1980-90: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995*, FHWA-PL-97-009 (Washington, DC: July 1997), table VM-202.

1995-97: Ibid., *Highway Statistics* (Washington, DC: Annual issues), tables VM-2 and VM-2A.

Lane-kilometers: 1980-95: Ibid., Office of Highway Information Management, unpublished data, 1997, table HM-260.

1996-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table HM-60.

KEY: R = revised

Table 1-31M U.S. Passenger-Kilometers (Millions)

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998
Air											
Air carrier, certificated, domestic, all services	^R 50,049	^R 85,659	^R 174,521	218,871	^R 328,899	^R 447,135	^R 556,630	^R 649,996	^R 699,506	^R 725,191	745,549
General aviation ^a	3,701	7,081	14,645	18,347	23,657	19,795	^R 20,922	^R 17,381	^R 19,312	20,117	21,404
Highway^R											
Passenger car ^{b,c}	1,842,177	2,244,722	2,817,801	3,144,930	3,237,988	3,370,971	3,671,550	3,655,326	3,733,228	3,819,037	3,929,311
Motorcycle ^{b,c}	^f	^f	5,274	9,965	19,725	19,009	19,995	18,604	18,825	19,145	19,484
Other 2-axle 4-tire vehicle ^c	^g	^g	363,090	584,623	838,106	1,107,378	1,608,950	2,085,147	2,153,524	2,245,380	2,286,261
Truck											
Single-unit 2-axle 6-tire or more truck	158,603	207,234	43,583	55,693	64,073	73,130	83,527	100,914	103,006	107,654	109,265
Combination truck	46,436	50,960	56,543	75,195	110,527	125,630	151,827	185,801	191,245	200,499	206,252
Bus ^d	N	N	N	N	N	152,767	195,372	219,039	223,918	233,452	238,706
Total^c	2,047,216	2,502,916	3,286,290	3,870,406	4,270,419	4,848,887	5,731,220	6,264,830	6,423,746	6,625,167	6,789,280
Transit											
Motor bus ^d	N	N	N	N	^R 35,068	^R 34,055	^R 33,766	^R 30,285	^R 30,732	^R 31,550	^P 33,156
Light rail	N	N	N	N	613	563	919	1,384	1,540	^R 1,666	^P 1,799
Heavy rail	N	N	N	N	^R 16,991	^R 16,781	^R 18,467	^R 16,993	^R 18,556	^R 19,402	^P 19,769
Trolley bus	N	N	N	N	352	492	311	301	296	304	^P 293
Commuter rail ^R	6,754	6,643	7,390	7,263	10,487	10,515	11,397	13,267	13,440	12,936	14,027
Demand responsive ^d	N	N	N	N	N	586	694	977	1,056	^R 1,213	1,629
Ferry boat	N	N	N	N	^h	^h	460	418	412	562	^P 555
Other	N	N	N	N	628	707	200	439	560	^R 505	^P 639
Total^R	ⁱ6,754	ⁱ6,643	ⁱ7,390	ⁱ7,263	64,139	63,700	66,213	64,065	66,592	^R68,138	^P71,867
Rail											
Intercity/Amtrak ^{e,R}	27,462	21,340	9,944	6,326	7,247	7,765	9,748	8,924	8,127	8,314	8,536

KEY: N = data do not exist; P = preliminary;
R = revised

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Table 1-31M
Cont'd**U.S. Passenger-Kilometers (Millions)**

^a All operations other than those operating under 14 CFR 121 and 14 CFR 135.

^b U.S. Department of Transportation, Federal Highway Administration (FHWA), provides data separately for passenger car and motorcycle in its annual Highway Statistics series. However, the 1995 summary report provides updated data for passenger car and motorcycle combined. Passenger car figures in this table were computed by U.S. Department of Transportation, Bureau of Transportation Statistics by subtracting the most current motorcycle figures from the aggregate passenger car and motorcycle figures.

^c In July 1997, FHWA published revised passenger-kilometers data for the highway modes for a number of years. The major change reflected the reassignment of some vehicles from the passenger car category to the other 2-axle 4-tire vehicle category. Passenger-kilometers for passenger car, motorcycle, and other 2-axle 4-tire vehicles were derived by multiplying vehicle-kilometers for these vehicles by average vehicle occupancy rates, provided by the Nationwide Personal Transportation Survey, 1977, 1983, and 1995.

^d Motor bus and demand responsive figures are also included in the bus figure for highway.

^e Amtrak began operations in 1971. Does not include contract commuter passengers.

^f Included in passenger car.

^g Included in other single-unit 2-axle 6-tire or more truck.

^h Ferry boat included in other.

ⁱ Includes commuter rail figures only.

NOTES: Air carrier passenger-kilometers are computed by summing of the products of the aircraft-kilometers flown on each interairport segment multiplied by the number of passengers carried on that segment. Highway passenger-kilometers are calculated by multiplying vehicle-kilometers of travel as cited by FHWA by the average number of occupants for each vehicle type. Average vehicle occupancy rates are based on various sources, such as the Nationwide Personal Transportation Survey, conducted by the Federal Highway Administration, and the Truck Inventory and Use Survey, conducted by the Bureau of the Census. Transit passenger-kilometers are the cumulative sum of the distances ridden by each passenger. Rail passenger-kilometers represent the movement of 1 passenger for 1 kilometer.

SOURCES:**Air:**

Air carrier, domestic, all services: 1960: Civil Aeronautics Board, *Handbook of Airline Statistics 1969* (Washington, DC: 1970), part III, table 2.

1965-70: Ibid., *Handbook of Airline Statistics 1973* (Washington, DC: 1974), part III, table 2.

1975-80: Ibid., *Air Carrier Traffic Statistics* (Washington, DC: 1976, 1981), p. 4 (December 1976) and p. 2 (December 1981).

1985-98: U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information, *Air Carrier Traffic Statistics* (Washington, DC: Annual December issues), page 2, line 1.

General aviation: 1960-97: Eno Transportation Foundation, Inc., *Transportation in America, 1998* (Washington, DC: 1998), p. 47.

Highway:

Passenger car and motorcycle: 1960-90: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995* (updated June 1999), Internet site <http://www.fhwa.dot.gov/ohim/summary95/index.html>, as of July 28, 2000, table VM-201A.

1995-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1, sum of passenger car and motorcycle.

Motorcycle: 1970-80: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics, Summary to 1985* (Washington, DC: 1986), table VM-201A.

1985-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

Other 2-axle 4-tire vehicle: 1970-90: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995* (updated June 1999), Internet site <http://www.fhwa.dot.gov/ohim/summary95/index.html>, as of July 28, 2000, table VM-201A.

1995-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

Single-unit 2-axle 6-tires or more truck, combination truck, and bus: 1960-90: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995* (updated June 1999), Internet site <http://www.fhwa.dot.gov/ohim/summary95/index.html>, as of July 28, 2000, table VM-201A.

1995-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

Transit:

All other data: 1960-98: American Public Transit Association, *Transit Fact Book* (Washington, DC: 2000), table 30 and similar tables in earlier editions.

Rail:

Intercity/Amtrak: 1960-80: Association of American Railroads, *Railroad Facts* (Washington, DC: Annual issues).

1985: Amtrak, *Amtrak FY95 Annual Report* Statistical Appendix (Washington, DC: 1996), p. 4.

1990-98: Ibid., *Amtrak FY99 Annual Report* Statistical Appendix (Washington, DC: 2000), p. 43.

Table 1-41M U.S. Tonne-Kilometers of Freight (Millions)

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998
Air carrier, domestic, all services^a	807	1,975	3,955	5,066	6,611	7,528	13,233	18,279	18,777	19,857	20,083
Intercity truck	^R 416,093	^R 524,131	^R 601,510	^R 662,829	^R 810,286	^R 890,585	^R 1,073,082	^R 1,344,637	^R 1,419,096	^R 1,454,135	^R 1,499,394
Class I rail^b	^R 835,557	^R 1,018,884	^R 1,116,602	^R 1,101,189	^R 1,341,656	^R 1,280,375	^R 1,509,569	^R 1,906,272	^R 1,979,690	^R 1,969,398	^R 2,010,096
Domestic water transportation											
Coastwise	U	^R 441,709	^R 525,276	^R 461,127	^d ^R 921,462	^R 892,010	^R 699,523	^R 642,893	^R 595,795	^R 510,762	459,694
Lakewise	U	110,838	115,946	100,033	90,149	70,347	88,956	87,166	^R 85,168	90,761	90,013
Internal	U	160,161	227,487	263,378	^R 331,915	^R 339,748	426,886	^R 447,233	433,307	^R 429,266	430,541
Intrahort	U	2,392	1,721	1,785	2,331	1,609	1,587	1,971	2,153	2,012	2,016
Total domestic water transportation^c	U	715,100	870,430	826,322	1,345,856	1,303,714	1,216,953	1,179,263	1,116,424	1,032,801	982,264
Oil pipeline	334,334	446,752	^R629,249	^R740,207	^R858,757	^R823,864	^R852,771	^R877,591	^R904,017	^R900,075	904,892
TOTAL	^R2,280,481	^R2,706,794	^R3,222,165	^R3,336,043	^R4,363,865	^R4,305,466	^R4,666,080	^R5,325,989	^R5,438,407	^R5,375,628	5,416,507

^a Includes freight, express, and mail revenue tonne-kilometers as reported on U.S. DOT Form 41.

^b Revenue tonne-kilometers.

^c Excludes intraterritorial traffic, for which tonne-kilometers were not compiled.

^d Reflects startup between 1975 and 1980 of Alaska pipeline and consequent water transportation of crude petroleum from Alaskan ports to mainland United States for refining.

NOTE: Domestic water transportation numbers may not add to totals due to rounding.

SOURCES:

Air carrier, domestic, all services: 1960-65: Civil Aeronautics Board, Handbook of Airline Statistics, 1969 (Washington, DC: 1970).

1970-80: Ibid., *Air Carrier Traffic Statistics* (Washington, DC: Annual issues), p. 2, line 3.

1985-98: U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information, *Air Carrier Traffic Statistics* (Washington, DC: Annual issues), p. 2, line 3.

Intercity truck: 1960-98: Eno Transportation Foundation, Inc., *Transportation in America*, 1998 (Washington, DC: 1999), p. 44.

Class I rail: 1960-98: Association of American Railroads, *Railroad Facts 1998* (Washington, DC: 1999), p. 27.

Domestic water transportation: 1965-98: U.S. Army Corps of Engineers, *Waterborne Commerce of the U.S.* (New Orleans, LA: Annual issues), part 5, section 1, table 1-4, and similar tables in earlier editions.

Oil pipeline: 1960-70: Eno Transportation Foundation, Inc., *Transportation in America*, 1998 (Washington, DC: 1998), p. 44.

1975: Association of Oil Pipe Lines, *Shifts in Petroleum Transportation* (Washington, DC: Annual issues), table 4.

1980-98: Ibid., *Shifts in Petroleum Transportation* (Washington, DC: Annual issues), table 1.

KEY: R = revised; U = data are not available

Table 1-42M

Average Length of Haul, Domestic Freight and Passenger Modes (Kilometers)

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998
Freight											
Air carrier	1,534	1,518	1,632	1,741	1,693	1,862	2,235	^R 1,720	^R 1,730	^R 1,453	1,432
Truck ^a	438	417	423	460	584	589	629	669	^R 686	^R 700	715
Class I rail	742	810	829	871	991	1,070	1,168	1,357	1,355	1,370	1,344
Water											
Coastwise	2,408	2,416	2,429	2,192	3,082	3,174	2,581	2,659	2,456	2,140	2,029
Lakewise	840	795	814	853	863	843	890	827	818	816	813
Internal	454	478	531	576	652	700	756	795	768	750	760
Intraport	U	U	U	26	27	24	21	26	27	24	24
Oil Pipeline											
Crude	523	515	483	1,019	1,402	1,250	1,296	^R 1,202	^R 1,254	^R 1,147	1,109
Petroleum products	433	539	575	830	666	629	626	^R 632	^R 632	^R 632	632
Passenger											
Air carrier, domestic, scheduled	938	988	1,091	1,123	1,184	1,220	1,292	1,273	1,291	^R 1,315	1,308
Bus, intercity	127	151	171	182	201	195	227	225	230	^R 232	232
Commuter rail	33	34	36	37	37	38	35	39	39	^R 37	U
Amtrak ^b	^R N	^R N	^R N	^R 380	^R 348	^R 372	439	431	414	412	406

^a Total Class I and Class II motor carriers of freight (less-than-truckload, specialized carrier for truckload, and others).

^b Amtrak began operations in 1971. Data are reported for fiscal years.

NOTES: Conversion to Kilometers occurred after the following calculations. Average length of haul for freight is calculated by dividing ton-miles in table 1-11 by estimates of tonnage from the various data sources. The calculation of average length of haul for passenger trips varies by mode: for air carrier it is calculated by dividing revenue passenger-miles by revenue passenger enplanements; for commuter rail, intercity bus, and Amtrak it is calculated by dividing passenger-miles by number of passengers.

SOURCES:

Freight:

Air carrier, truck: Eno Transportation Foundation, Inc., *Transportation In America, 1999* (Washington, DC: 1999), p. 71.

Class I rail: Association of American Railroads, *Railroad Facts* (Washington, DC: 1999), p. 36.

Water: U.S. Army Corps of Engineers, *Waterborne Commerce of the United States, Part 5* (New Orleans, LA: Annual issues), section 1, Table 1-4.

Oil pipeline: 1960-70: Transportation Policy Associates, Washington, DC, personal communication.

1975-98: Eno Transportation Foundation, Inc., *Transportation in America, 1999* (Washington, DC: 1999), p. 71.

Passenger:

Air carrier: U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information, *Air Carrier Traffic Statistics* (Washington, DC: Annual issues).

Intercity bus and commuter rail: Eno Transportation Foundation, Inc., *Transportation in America, 1999* (Washington, DC: 1999), p. 70.

Amtrak: 1970-85: Amtrak, corporate communication, Jan. 26, 1999.

1990-98: *Amtrak, Amtrak FY99 Annual Report* (Washington, DC), statistical appendix, p. III.

KEY: N = data do not exist; R = revised;
U = data are not available

Table 1-46M U.S. Waterborne Freight (Million metric tons)

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998
Foreign	307.8	402.5	527.0	679.2	835.9	702.5	944.9	1,040.9	1,073.6	1,107.3	1,129.8
Imports	191.7	244.8	307.8	432.3	469.5	374.4	544.3	610.2	664.6	715.1	762.7
Exports	116.1	157.8	219.2	246.9	366.4	328.1	400.6	430.6	409.0	392.2	367.1
Domestic	690.0	752.2	862.5	858.5	977.5	920.0	1,018.1	991.6	998.5	^R 1,009.3	992.6
Inland	264.0	335.3	428.3	457.2	485.3	485.0	564.8	562.7	564.3	572.0	567.0
Coastal	189.8	182.8	216.3	210.4	299.0	281.0	270.9	241.9	242.6	238.7	226.4
Great Lakes	140.7	139.4	142.5	117.3	104.4	83.4	99.9	105.3	104.2	111.3	110.9
Intraport	94.5	93.3	73.9	71.0	85.4	67.4	78.4	75.4	80.7	81.5	81.7
Intraterritory	0.9	1.3	1.5	2.6	3.3	3.1	4.1	6.2	6.6	5.7	6.5
Total	997.8	1,154.8	1,389.5	1,537.7	1,813.4	1,622.4	1,963.0	2,032.5	2,072.1	2,116.6	2,122.4

NOTE: Beginning in 1996, shipments of fish are excluded from domestic tonnage totals.

SOURCE: U.S. Army Corps of Engineers, *Waterborne Commerce of the U.S.* (New Orleans, LA: March 2000). Part 5, section 1.

KEY: R = revised

Table 1-51M Crude Oil and Petroleum Products Transported in the United States by Mode

	1975	1980	1985	1990	1995	1996	1997	1998
Crude Oil								
Tonne-kilometers (billions)								
Pipelines ^a	420.5	529.4	488.2	488.8	490.4	493.9	492.6	487.8
Water carriers	59.3	^c 565.6	655.8	425.1	361.6	295.5	215.1	172.1
Motor carriers ^b	2.0	3.6	2.6	2.2	2.5	2.5	2.5	2.3
Railroads	2.2	0.7	1.2	1.0	1.2	1.2	0.7	0.7
Total	484.0	1099.3	1147.8	917.2	855.7	793.1	710.9	663.0
% of total								
Pipelines ^a	86.9	48.2	42.5	53.3	57.3	62.3	69.3	73.6
Water carriers	12.2	51.4	57.1	46.4	42.3	37.3	30.3	26.0
Motor carriers ^b	0.4	0.3	0.2	0.2	0.3	0.3	0.3	0.4
Railroads	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Refined Petroleum Products								
Tonne-kilometers (billions)								
Pipelines ^a	319.7	329.4	335.6	364.0	387.2	410.1	407.5	417.1
Water carriers	375.8	336.4	206.1	230.4	223.7	225.0	216.5	214.8
Motor carriers ^b	38.3	35.5	39.3	41.2	35.9	40.9	38.0	39.0
Railroads	18.4	17.5	16.5	19.4	23.2	23.4	23.7	23.7
Total	752.2	718.7	597.6	654.9	670.0	699.3	685.6	694.5
% of total								
Pipelines ^a	66.1	30.0	29.2	39.7	45.2	51.7	57.3	62.9
Water carriers	77.6	30.6	18.0	25.1	26.1	28.4	30.5	32.4
Motor carriers ^b	7.9	3.2	3.4	4.5	4.2	5.2	5.3	5.9
Railroads	3.8	1.6	1.4	2.1	2.7	2.9	3.3	3.6
Combined Crude and Petroleum Products								
Tonne-kilometers (billions)								
Pipelines ^a	740.2	858.8	823.9	852.8	877.6	904.0	900.1	904.9
Water carriers	435.1	^c 902	862.0	655.5	585.3	520.5	431.6	386.9
Motor carriers ^b	40.3	39.1	41.9	43.4	38.4	43.4	40.4	41.3
Railroads	20.6	18.2	17.7	20.4	24.2	24.5	24.4	24.4
Total	846.7	1,818.1	1,745.4	1,572.1	1,525.5	1,492.4	1,396.5	1,357.5
% of total								
Pipelines ^a	87.4	47.2	47.2	54.2	57.5	60.6	64.5	66.7
Water carriers	51.4	72.4	49.4	41.7	38.4	34.9	30.9	28.5
Motor carriers ^b	4.8	2.2	2.4	2.8	2.5	2.9	2.9	3.0
Railroads	2.4	1.0	1.0	1.3	1.6	1.6	1.7	1.8

^a The amount carried by pipeline is based on tonne-kilometers of crude and petroleum products for federally regulated pipelines (84%), plus an estimated breakdown of crude and petroleum products for the tonne-kilometers for pipelines not federally regulated (16%).

^b The amount carried by motor carriers is estimated.

^c Reflects the entrance between 1975 and 1980 of the Alaska pipeline, moving crude petroleum for water transportation to U.S. refineries.

SOURCES: 1975: Association of Oil Pipe Lines, *Shifts in Petroleum Transportation* (Washington, DC: Annual issues), table 6.
1980-98: Ibid., *Shifts in Petroleum Transportation* (Washington, DC: Annual issues), table 3.

Table 4-3M Domestic Demand for Refined Petroleum Products by Sector (Petajoules)

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998	1999
Transportation	10,688	12,524	^R 16,154	18,580	20,057	20,574	^R 23,012	^R 24,478	^R 25,048	^R 25,322	^R 25,998	26,620
Industrial	6,067	7,164	8,219	8,599	10,055	8,240	8,778	9,095	9,601	9,823	^R 9,654	9,981
Residential and commercial	3,682	4,083	4,547	4,020	^R 3,208	2,659	^R 2,290	2,195	2,321	2,258	^R 2,079	2,184
Electric utilities	579	771	2,237	3,346	2,770	1,155	1,323	694	770	865	1,234	992
Total petroleum demand	^R21,017	^R24,542	^R31,157	^R34,533	^R36,084	^R32,628	^R35,403	^R36,454	^R37,730	^R38,268	^R38,965	39,788
Transportation as % of total	50.9	51.0	51.8	53.8	55.6	63.1	65.0	^R 67.1	^R 66.4	^R 66.2	^R 66.7	66.9

NOTE: Transportation's share of U.S. petroleum demand in this table differs slightly from table 4-1 because this table takes into account that sectors use various grades of petroleum-based fuel that have different Petajoule content per unit volume.

SOURCES: 1960-70: U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 1997*, DOE/EIA-0384(97) (Washington, DC: July 1998), tables 2.1, 5.12b, and A3.

1975-99: Ibid., Monthly Energy Review, Internet site www.eia.doe.gov/gov/pub/energy.overview/monthly.energy/, as of May 8, 2000, tables, 1.4, 2.3, 2.4, 2.5, and 2.6.

KEY: R = revised

Table 4-5M

Fuel Consumption by Mode of Transportation

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998
Air											
Certificated carriers ^a											
Jet fuel (million liters)	7,397	14,721	29,742	28,610	34,432	38,312	^R 47,049	48,499	49,922	51,709	52,530
General aviation ^b											
Aviation gasoline (million liters)	916	1,105	2,086	1,560	1,968	1,594	1,336	1,045	1,086	^R 1,105	1,177
Jet fuel (million liters)	N	212	787	1,715	2,900	2,616	2,510	2,059	2,150	^R 2,430	3,085
Highway											
Gasoline, diesel and other fuels (million liters)											
Passenger car and motorcycle	155,849	188,222	256,950	281,078	265,683	271,414	264,067	258,424	262,780	^R 265,335	274,117
Other 2-axle 4-tire vehicle	N	^e	46,610	72,229	90,078	103,580	134,802	172,634	179,254	^R 186,954	191,462
Single-unit 2-axle 6-tire or more truck	N	52,420	15,021	20,517	26,206	28,008	31,635	34,886	35,617	^R 36,249	36,874
Combination truck	N	25,203	27,815	34,739	49,350	53,015	61,070	74,864	76,439	^R 76,851	79,872
Bus	3,131	3,312	3,104	3,986	3,854	3,157	3,388	3,664	3,748	^R 3,888	3,971
Transit^c											
Electricity (million kWh)	2,908	2,584	2,561	2,646	2,446	4,216	4,837	5,068	5,007	^R 4,988	^P 5,250
Motor fuel (million liters)											
Diesel	787	939	1,026	1,382	1,632	2,305	2,464	2,567	2,623	^R 2,714	^P 2,650
Gasoline and other nondiesel fuels ^d	727	469	257	30	42	174	129	231	231	^R 223	^P 189
Compressed natural gas	N	N	N	N	N	N	N	42	57	^R 91	^P 117
Rail, Class I (in freight service)											
Distillate/diesel fuel (million liters)	13,109	13,597	13,419	13,843	14,778	11,773	11,792	13,173	13,548	13,533	13,563
Amtrak											
Electricity (million kWh)	N	N	N	180	254	295	330	304	293	282	275
Distillate/diesel fuel (million liters)	N	N	N	238	242	246	310	250	269	284	284
Water											
Residual fuel oil (million liters)	14,960	11,708	14,286	15,369	33,887	17,375	23,947	22,281	21,581	18,965	21,274
Distillate/diesel fuel oil (million liters)	2,979	2,468	3,100	4,156	5,595	6,431	7,817	8,854	9,429	9,744	9,823
Gasoline (million liters)	N	N	2,264	2,763	3,982	3,986	4,921	4,013	3,763	3,736	3,619
Pipeline											
Natural gas (million cubic meters)	9,828	14,173	20,449	16,508	17,970	14,265	18,684	19,831	20,146	^R 21,279	17,995

KEY: kWh = kilowatt-hour; N = data do not exist;
P = preliminary; R = revised

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Table 4-5M
Cont'd**Fuel Consumption by Mode of Transportation**^a Domestic operations only.^b Includes fuel used in air taxi operations, but not commuter operations. Data for 1996 are estimated using new information on nonrespondents and are therefore not comparable to earlier years. See the accuracy statement at the end of this chapter for more detailed information.^c Prior to 1984, excludes commuter rail, automated guideway, ferryboat, demand responsive vehicles, and most rural and smaller systems.^d Gasoline and all other nondiesel fuels such as liquefied natural gas, methanol and propane, except compressed natural gas.^e Included in single-unit 2-axle 6-tire or more truck category.**SOURCES:****Air:***Certificated air carriers:* 1960-98: U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information, Internet site <http://www.bts.gov/oai/fuel/fuelyearly.html>, as of July 5, 2000.*General aviation:* 1960-70: U.S. Department of Transportation, Federal Aviation Administration, *FAA Statistical Handbook of Aviation - 1972 edition* (Washington, DC: 1973), table 9.12.1975-97: *Ibid.*, General Aviation and Air Taxi Activity Survey (Washington, DC: Annual issues), table 5.1, and similar tables in earlier editions.1998: *Ibid.*, *FAA Aerospace Forecasts Fiscal Years 2000-2011* (Washington, DC: March 2000), table 29.**Highway:**

1960-90: U.S. Department of Transportation, Federal Highway Administration, Highway Statistics, Summary to 1995, FHWA-PL-97-009 (Washington, DC: July 1997), table VM-201A.

1995-98: *Ibid.*, *Highway Statistics* (Washington, DC: Annual issues), table VM-1.**Transit:***Electricity/motor fuel/compressed natural gas:* 1960-98: American Public Transit Association, *Transportation Fact Book* (Washington, DC: February 1999), tables 65, 66, 67, and similar tables in earlier editions.**Rail:**1960-98: Association of American Railroads, *Railroad Facts* (Washington, DC: May 1999), p. 40.**Amtrak:**

1975-98: Amtrak, State and Local Affairs Department, personal communication.

Water:*Residual and distillate/diesel fuel oil:* 1960-80: American Petroleum Institute, *Basic Petroleum Data Book* (Washington, DC: Annual issues), tables 10, 10a, 12, and 12a.1985-98: U.S. Department of Energy, Energy Information Administration, *Fuel Oil and Kerosene Sales* (Washington, DC: Annual issues), tables 2 and 4, and similar tables in earlier editions.*Gasoline:* 1970-98: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: Annual issues), table MF-24 and similar tables in earlier editions.**Pipeline:**1960-96: U.S. Department of Energy, *Natural Gas Annual 1997* (Washington, DC: October 1998), table 101.1997-98: *Ibid.*, table 1.

Table 4-6M Energy Consumption by Mode of Transportation (Petajoules)

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998
Air											
Certificated carriers ^a											
Jet fuel	278	554	1,119	1,077	^R 1,213	1,442	^R 1,770	1,825	1,878	1,946	1,976
General aviation ^b											
Aviation gasoline	31	37	70	52	66	53	45	^R 37	^R 37	37	39
Jet fuel	N	8	30	65	109	98	94	^R 80	^R 87	^R 92	116
Highway											
Gasoline, diesel and other fuels											
Passenger car and motorcycle	5,430	6,558	8,952	9,793	^R 9,257	9,456	9,200	^R 9,004	9,155	^R 9,245	9,551
Other 2-axle 4-tire vehicle	N	^d	1,624	^R 2,517	3,138	3,609	^R 4,697	^R 6,015	6,245	^R 6,513	6,671
Single-unit 2-axle 6-tire or more truck	N	2,027	581	793	1,013	1,083	1,223	1,349	1,377	1,401	1,425
Combination truck	N	974	1,075	1,343	1,908	^R 2,050	2,361	2,894	2,955	^R 2,971	3,088
Bus	121	128	120	154	149	122	131	142	^R 145	150	153
Transit^c											
Electricity	10	9	9	10	9	15	17	18	18	18	^P 19
Motor fuel											
Diesel	30	36	40	53	63	89	95	100	101	^R 104	^P 102
Gasoline and other nondiesel fuels ^e	25	16	9	1	1	6	4	8	8	8	^R 6
Compressed natural gas	N	N	N	N	N	N	N	^R 1	2	3	^R 4
Rail, Class I (in freight service)											
Distillate/diesel fuel	507	526	519	535	571	455	456	509	524	523	524
Amtrak											
Electricity	N	N	N	1	1	1	1	1	1	1	1
Distillate/diesel fuel	N	N	N	9	9	10	12	10	10	11	11
Water											
Residual fuel oil	624	489	596	641	1,414	725	999	930	900	791	888
Distillate/diesel fuel oil	115	95	120	161	216	249	302	342	365	377	380
Gasoline	N	N	79	96	139	139	171	140	131	130	126
Pipeline											
Natural gas	378	544	786	634	690	548	718	762	774	818	691

KEY: kWh = kilowatt-hour; N = data do not exist;
P = preliminary; R = revised

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Table 4-6M
Cont'd**Energy Consumption by Mode of Transportation (Petajoules)**^a Domestic operations only.^b Includes fuel used in air taxi operations, but not commuter operations.^c Prior to 1984, excludes commuter rail, automated guideway, ferryboat, demand responsive vehicles, and most rural and smaller systems.^d Included in other single-unit 2-axle 6-tire or more truck category.^e Gasoline and all other nondiesel fuels such as liquefied natural gas, methanol, and propane, except compressed natural gas.**NOTES:** The following conversion rates were used:

Jet fuel = 37,626,700 joules/ liters

Compressed natural gas = 38,657,950 joules/ liters

Aviation gasoline = 33,501,698 joules/ liters

Residual fuel = 41,723,829 joules/ liters

Automotive gasoline = 34,839,537 joules/ liters

Residual fuel = 41,723,829 joules/ liters

Diesel motor fuel = 38,657,950 joules/ liters

Natural gas = 38,413,974 joules/ m³

Electricity 1kWh = 3,600,000 joules, negating electrical system losses. To include electrical system losses, multiply this conversion factor by approximately 3.

SOURCES:**Air:***Certificated air carriers:* 1960-98: U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information Internet site <http://www.bts.gov/oai/fuel/fuelyearly.html>, as of July 5, 2000.*General aviation:* 1960-80: U.S. Department of Transportation, Federal Aviation Administration, Office of Aviation Policy, Plans, and Management Analysis, *FAA Statistical Handbook of Aviation* (Washington, DC: Annual issues).1985-97: Ibid., *General Aviation and Avionics Survey* (Washington, DC: Annual issues), table 5.1 and similar tables in earlier editions.1998: Ibid. *FAA Aerospace Forecasts Fiscal Years 2000-2011* (Washington, DC: March 2000), table 29.**Highway:**1960-90: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics, Summary to 1995, FHWA-PL-97-009* (Washington, DC: July 1997), table VM-201A.1995-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.**Transit:***Electricity/ motor fuel/ compressed natural gas:* 1960-98: American Public Transit Association, *Transportation Fact Book* (Washington, DC: February 1999), tables 65, 66, 67, and similar tables in earlier editions.**Rail:**1960-98: Association of American Railroads, *Railroad Facts* (Washington, DC: May 1999), p. 40.**Amtrak:**

1975-98: Amtrak, State and Local Affairs Department, personal communication.

Water:Residual and distillate/diesel fuel oil: 1960-80: American Petroleum Institute, *Basic Petroleum Data Book* (Washington, DC: Annual issues), tables 10, 10a, 12, and 12a.1985-98: U.S. Department of Energy, Energy Information Administration, *Fuel Oil and Kerosene Sales* (Washington, DC: Annual issues), tables 2 and 4, and similar tables in earlier editions.*Gasoline:* 1970-98: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics* (Washington, DC: Annual issues), table MF-24 and similar tables in earlier editions.**Pipeline:**1960-96: U.S. Department of Energy, *Natural Gas Annual 1997* (Washington, DC: October 1998), table 101.

1997-98: Ibid., table 1.

Table 4-7M Domestic Demand for Gasoline (Million liters) by Mode

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998
Highway	209,820	253,541	324,025	376,094	383,019	391,960	414,614	443,125	452,412	457,800	472,018
Nonhighway											
Agriculture	8,675	7,432	7,313	5,924	4,009	4,091	2,579	3,508	3,475	3,727	3,433
Aviation ^a	5,011	1,898	1,488	1,551	1,563	1,444	1,366	1,389	1,301	1,267	1,329
Marine	230	365	2,264	2,762	3,983	3,986	4,923	4,014	3,761	3,737	3,619
Other ^b	6,270	6,235	4,087	3,551	4,280	5,639	6,562	3,172	3,124	3,749	4,050
Total nonhighway	20,185	15,930	15,152	13,788	13,834	15,160	15,430	12,083	11,662	12,479	12,431
TOTAL demand	230,005	269,471	339,178	389,882	396,854	407,121	430,044	455,209	464,074	470,279	484,449

^a Does not include aviation jet fuel.

^b Includes state, county, and municipal use, industrial and commercial use, construction use, and miscellaneous.

NOTES: All nonhighway uses of gasoline were estimated by the U.S. Department of Transportation, Federal Highway Administration or data were obtained from other sources. These estimates may not be comparable to data for prior years due to revised estimation procedures.

Numbers may not add to totals due to rounding.

SOURCES:

Highway: 1960-95: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics, Summary to 1995* (Washington, DC: 1996), table MF-221.

1996-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table MF-21.

Nonhighway: 1960-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table MF-24, and unpublished revisions.

Table 4-8M **Certificated Air Carrier Fuel Consumption and Travel^a**

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998	1999
Number of aircraft	2,135	2,125	2,679	2,495	3,808	4,678	6,083	7,411	7,478	7,616	^R 8,111	8,228
Average kilometers flown per aircraft (thousands)	784	1,074	1,528	^R 1,500	1,236	1,191	1,250	1,222	1,260	1,273	^R 1,234	1,246
Aircraft-kilometers (millions)												
Domestic operations	1,381	1,825	3,328	3,135	4,060	4,902	6,378	7,450	7,743	^R 7,904	8,097	8,330
International operations	293	457	764	607	645	668	1,223	1,606	1,679	1,793	1,917	1,926
Fuel consumption (million liters)												
Domestic operations	7,397	14,721	29,742	28,610	34,432	^R 38,289	^R 47,049	48,499	^R 49,918	51,709	52,530	54,854
International operations	2,143	4,845	8,491	7,378	7,336	^R 9,418	^R 15,002	^R 17,076	^R 17,632	18,791	19,631	19,976
Aircraft-kilometers flown per liter												
Domestic operations	0.19	0.12	0.11	0.11	0.12	0.13	0.14	0.15	0.16	0.15	0.15	0.15
International operations	0.14	0.09	0.09	0.08	0.09	0.07	0.08	0.09	0.10	0.10	0.10	0.10

^a Aircraft operating under 14 CFR 121 and 14 CFR 135.

SOURCES:

Number of aircraft: 1960-65: U.S. Department of Transportation, Federal Aviation Administration, *FAA Statistical Handbook of Aviation, 1970 edition* (Washington, DC: 1970), table 5.3.

1970-75: Ibid., *FAA Statistical Handbook of Aviation, Calendar Year 1979* (Washington, DC: 1979), table 5.1.

1980-85: Ibid., *FAA Statistical Handbook of Aviation, Calendar Year 1986* (Washington, DC: 1986), table 5.1.

1990-97: Ibid., *FAA Statistical Handbook of Aviation, Calendar Year 1997* (Washington, DC: unpublished), personal communication, Mar. 19, 1999.

1998-99: Aerospace Industries Association, *Aerospace Facts and Figures* (Washington DC: Annual Issues), "Active U.S. Air Carrier Fleet".

Aircraft-kilometers flown: 1960: Civil Aeronautics Board, *Handbook of Airline Statistics 1969* (Washington, DC: 1970), part III, tables 2 and 13.

1965-70: Ibid., *Handbook of Airline Statistics 1973* (Washington, DC: 1974), part III, tables 2 and 13.

1975-80: Ibid., *Air Carrier Traffic Statistics* (Washington, DC: December 1976), pp. 4 and 14; and (December 1981), pp. 2 and 3.

1985-98: U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information, *Air Carrier Traffic Statistics* (Washington, DC: Annual issues, December), pp. 2 and 3, line 27 plus line 50.

1999: Ibid., Internet site <http://www.bts.gov/programs/oai>, as of July 14, 2000.

Fuel consumption: 1960-99: U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information, Internet site <http://www.bts.gov/programs/oai/fuel/fuelyearly.html>, as of July 5, 2000.

1999: Ibid., Personal communication, July 27, 2000.

KEY: R = revised; U = data are unavailable

Table 4-9M Motor Vehicle Fuel Consumption and Travel

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998
Vehicles registered (thousands) ^a	73,858	90,358	111,242	137,913	161,490	177,133	193,057	205,427	210,441	211,580	215,496
Vehicle-kilometers traveled (millions) ^R	1,157,120	1,429,100	1,786,375	2,137,213	2,457,473	2,856,591	3,450,440	3,899,448	4,000,837 ^R	4,122,656	4,225,127
Fuel consumed (million liters)	219,100	269,158	349,503	412,549	435,171	459,174	494,962	544,471	557,837	^R 569,273	586,300
Average kilometers traveled per vehicle (thousands)	15.7	15.8	16.1	15.5	15.2	16.1	17.9	19.0	19.0	19.5	19.6
Average kilometers traveled per liter	5.3	5.3	5.1	5.2	5.6	6.2	7.0	7.2	7.2	7.2	7.2
Average fuel consumed per vehicle (liters)	^R 2,968	2,979	3,142	^R 2,990	2,695	^R 2,593	^R 2,563	2,650	^R 2,650	^R 2,691	2,722

^a Includes personal passenger vehicles, buses, and trucks.

NOTE: See tables 4-11, 4-12, 4-13, 4-14, and 4-15 for individual highway vehicles.

SOURCES: 1960-90: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995*, FHWA-PL-97-009 (Washington, DC: July 1997), table VM-201A.

1995-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

KEY: R = revised

Table 4-11M Passenger Car and Motorcycle Fuel Consumption and Travel

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998
Vehicles registered (thousands)											
Passenger cars	61,671	75,258	89,244	106,706	121,601	127,885	133,700	128,387	129,728	129,749	131,839
Motorcycles	574	1,382	2,824	4,964	5,694	5,444	4,259	3,897	3,872	3,826	3,879
Vehicle-kilometers traveled (millions)											
Passenger cars	945,000	1,164,000	1,476,000	1,664,000	1,790,000	2,007,000	2,266,000	2,314,000	2,366,000	^R 2,418,000	2,488,000
Motorcycles	^a	^a	4,800	9,000	16,400	14,600	15,400	15,800	15,900	^R 16,200	16,500
Fuel consumed (million liters)											
Passenger cars	155,849	188,222	256,723	280,650	264,911	270,725	^R 263,343	^R 257,680	262,030	^R 264,570	273,341
Motorcycles	^a	^a	227	428	772	689	723	742	750	765	776
Average kilometers traveled per vehicle (thousands)											
Passenger cars	15.3	15.5	16.5	15.6	14.7	15.7	16.9	18.0	18.2	18.6	18.9
Motorcycles	^a	^a	1.7	1.8	2.9	2.7	^R 2.2	4.1	4.1	^R 4.2	4.3
Average kilometers traveled per liter											
Passenger cars	6.1	6.2	5.7	5.9	6.8	7.4	8.6	9.0	9.0	9.1	9.1
Motorcycles	^a	^a	21	21	21	21	21	21	21	21	21
Average fuel consumed per vehicle (liters)											
Passenger cars	2,527	2,501	2,877	2,630	2,179	2,117	1,970	2,007	2,020	^R 2,039	2,073
Motorcycles	^a	^a	80	86	136	127	170	190	194	200	200

KEY: R = revised

Continued next page

Table 4-11M
Cont'd

Passenger Car and Motorcycle Fuel Consumption and Travel

^a Included in passenger car.

NOTE: See table 4-12 for other 2-axle 4-tire vehicles.

SOURCES:

Passenger car:

Number registered: 1960-90: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995*, FHWA-PL-97-009 (Washington, DC: July 1997), table MV-201.

1995-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

All other passenger car data: 1960-90: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995*, FHWA-PL-97-009 (Washington, DC: July 1997), table VM-201A. For 1970-94, the unrevised motorcycle vehicle-miles and fuel consumed are subtracted from the combined passenger car and motorcycle vehicle-miles and fuel consumed from VM-201A.

1995-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

Motorcycle:

Number registered: 1960-90: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995*, FHWA-PL-97-009 (Washington, DC: July 1997), table MV-201.

1995-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

All other motorcycle data: 1970-85: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1985*, table VM-201A.

1990-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1. Average kilometers traveled per vehicle, average kilometers traveled per liter, average fuel consumed per vehicle: Derived by calculation.

Table 4-13M Single-Unit 2-Axle 6-Tire or More Truck Fuel Consumption and Travel

	1970	1975	1980	1985	1990	1995	1996	1997	1998
Number registered (thousands)	3,681	4,232	4,374	4,593	4,487	5,024	^R 5,265	5,293	5,414
Vehicle-kilometers (millions) ^R	43,613	55,683	64,052	73,064	83,525	^R 100,914	^R 102,945	^R 107,654	109,265
Fuel consumed (million liters)	15,021	20,517	26,206	28,008	31,635	34,886	^R 35,450	^R 36,249	36,874
Average kilometers traveled per vehicle (thousands)	11.8	13.2	^R 14.6	15.9	18.6	20.1	19.6	20.3	20.2
Average kilometers traveled per liter	2.9	2.7	2.4	2.6	2.6	2.9	2.9	3.0	3.0
Average fuel consumed per vehicle (liters)	4,080	4,848	5,992	6,098	7,050	6,944	^R 6,734	^R 6,848	6,810

NOTES: In 1995, the U.S. Department of Transportation, Federal Highway Administration revised its vehicle categories beginning with 1993 data to include passenger cars, other 2-axle 4-tire vehicles, single-unit 2-axle 6-tire or more trucks, and combination trucks. Single-unit 2-axle 6-tire or more trucks are on a single frame with at least 2 axles and 6 tires. Pre-1993 data have been reassigned to the most appropriate category.

SOURCES: 1970-90: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995*, FHWA-PL-97-009 (Washington, DC: July 1997), table VM-201A.

1995-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

KEY: R = revised

Table 4-14M Combination Truck Fuel Consumption and Travel

	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998
Number registered (thousands)	787	905	1,131	1,417	1,403	1,709	1,696	1,747	1,790	1,831
Vehicle-kilometers traveled (millions) ^R	51,016	56,488	75,157	110,562	125,690	151,761	185,880	191,351	^R 200,499	206,252
Fuel consumed (million liters)	25,203	27,815	34,739	49,350	53,015	61,070	74,864	76,439	76,821	79,872
Average kilometers traveled per vehicle (thousands)	^R 64.9	62.4	66.5	^R 78.0	89.6	88.8	109.6	^R 109.5	112.0	112.6
Average kilometers traveled per liter	2.0	2.0	2.2	2.2	2.4	2.5	2.5	2.5	2.6	2.6
Average fuel consumed per vehicle (liters)	32,044	30,732	30,722	34,831	37,780	35,737	44,148	^R 43,763	^R 42,919	43,631

SOURCES: 1965-90: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995*, FHWA-PL-97-009 (Washington, DC: July 1997), table VM-201A.

1995-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

KEY: R = revised

Table 4-15M Bus Fuel Consumption and Travel

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998
Number registered (thousands)	272	314	378	462	529	593	627	686	695	698	716
Vehicle-kilometers traveled (millions) ^R	6,920	7,564	7,242	9,817	9,817	7,242	9,173	10,300	10,622	^R 11,011	11,259
Fuel consumed (million liters)	3,131	3,312	3,104	3,986	3,854	3,157	3,388	3,664	3,748	^R 3,888	3,971
Average kilometers traveled per vehicle (thousands)	25.4	^R 24.1	^R 19.2	21.2	^R 18.6	^R 12.2	^R 14.6	15.0	15.3	^R 15.8	15.7
Average kilometers traveled per liter	2.2	^R 2.3	2.3	2.5	2.5	2.3	2.7	2.8	2.8	2.8	2.8
Average fuel consumed per vehicle ^R (liters)	11,504	10,539	8,221	^R 8,627	^R 7,291	5,319	^R 5,406	5,345	^R 5,394	^R 5,568	5,549

NOTE: Includes both publicly and privately owned school, transit, and other commercial buses.

1995-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

KEY: R = revised

SOURCES: 1960-90: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995*, FHWA-PL-97-009 (Washington, DC: July 1997), table VM-201A.

Table 4-16M Transit Industry Electric Power and Primary Energy Consumption^a and Travel

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997 ^R	1998 ^P
Number of vehicles	65,292	61,717	61,298	62,183	75,388	94,368	92,961	115,874	122,362	126,360	128,970
Vehicle-kilometers traveled	3,449	3,232	3,030	3,502	3,681	4,492	^R 5,218	5,713	5,874	6,029	6,328
Electric power consumed (million kWh hours)	2,908	2,584	2,561	2,646	2,446	4,216	4,837	5,068	5,007	4,988	5,250
Primary energy consumed (thousand liters)											
Diesel	787,744	940,296	1,024,332	1,381,903	1,633,027	2,304,324	2,464,417	2,567,592	2,622,208	2,713,959	2,650,095
Gasoline and other nondiesel fuels ^b	726,421	470,148	258,165	28,678	43,154	173,008	128,348	229,888	231,716	225,092	190,804
Compressed natural gas	N	N	N	N	N	N	N	40,655	57,129	90,494	117,026

^a Prior to 1985, excludes commuter rail, automated guideway, urban ferryboat, demand responsive vehicles, and most rural and smaller systems.

^b For 1995-96, includes propane, liquid petroleum gas, liquefied natural gas, kerosene, and all other nondiesel fuels except compressed natural gas. From 1960 to 1990, includes propane.

NOTE: To convert to joules, use the following energy conversion factors: 1kWh=3,600,000 joules, negating electrical system losses. To include electrical system losses, multiply this conversion factor by approximately three; 1 liter of gasoline = 34,839,537 joules; 1 liter of diesel fuel=38,657,950 joules. APTA changed from American Public

Transit Association to American Public Transportation Association in January 2000. The APTA Transit Fact Book changed to the Public Transportation Fact Book in March 2000.

SOURCE: American Public Transportation Association, *Public Transportation Fact Book* (Washington, DC: March 2000), tables 42, 46, 65, 66, 67, and similar tables in earlier editions of the APTA *Transit Fact Book*.

KEY: kWh = kilowatt hour; N = data do not exist; P = preliminary; R = revised

Table 4-17M Class I Rail Freight Fuel Consumption and Travel

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998
Number in use											
Locomotives ^a	29,031	27,780	27,077	27,846	28,094	22,548	18,835	18,812	19,269	19,684	20,261
Cars ^b	1,965,486	1,800,962	1,784,181	1,723,605	1,710,827	1,421,686	1,212,261	1,218,927	1,240,573	1,270,419	1,315,667
Kilometers traveled (millions)											
Freight train-kilometers ^c	650	677	687	648	689	559	611	738	754	764	764
Locomotive unit-kilometers	N	N	N	2,380	2,464	1,976	2,060	2,326	2,358	2,290	2,317
Car-kilometers	45,335	47,212	48,103	44,508	47,117	40,105	42,099	48,897	51,040	50,952	52,556
Average kilometers traveled per vehicle (thousands)											
Locomotives	N	N	N	85.5	87.7	87.6	109.4	123.6	122.4	116.3	114.4
Cars	23.1	26.2	27.0	25.8	27.5	28.2	34.7	40.1	41.1	40.1	39.9
Average kilometers traveled per liter											
Trains	0.05	0.05	0.19	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06
Cars	3.46	3.47	13.57	3.22	3.19	3.41	3.57	3.71	3.77	3.77	3.87
Fuel consumed (million liters)	13,109	13,597	13,419	13,843	14,778	11,773	11,792	13,173	13,548	13,533	13,563
Average fuel consumed per locomotive^a (thousand liters)	451.5	489.5	495.6	497.1	526.0	522.1	626.0	700.3	703.1	687.5	669.4

^a For 1960-80, locomotives total includes a small number of steam and electric units, which are not included in the per locomotive fuel consumption figure.

^b Includes cars owned by Class I railroads, other railroads, and car companies and shippers.

^c Based on the distance run between terminals and/or stations; does not include yard or passenger train-miles.

SOURCES:

All data except for locomotive unit-miles: Association of American Railroads, *Railroad Facts* (Washington, DC: October 1999), pp. 33, 34, 40, 48, 50.

Locomotive unit-miles: 1975-90: Ibid., *Railroad Ten-Year Trends* (Washington, DC: Annual issues).

1995-98: Ibid., *Analysis of Class I Railroads* (Washington, DC: Annual issues), p. 29

KEY: N = data do not exist

Table 4-19M

U.S. Government Energy Consumption by Agency and Source (Petajoules)

	Petroleum					Electricity	Natural gas	Coal and other ^b	Total
	Motor gasoline	Distillate and residual fuel oil	Jet fuel and aviation gas	Other ^a	Total				
1989									
Agriculture	4.7	0.7	0.1	0.2	5.7	1.9	1.5	0.1	9.2
Defense	18.9	232.9	793.4	3.9	1,049.1	126.3	114.1	55.2	1,344.6
Energy	1.4	3.3	0.5	0.2	5.3	20.3	9.7	11.4	46.7
GSA	0.1	0.5	0.0	0.0	0.7	7.8	2.8	2.0	13.4
Health and Human Services	0.2	2.0	0.0	0.1	2.4	2.6	1.9	0.1	7.1
Interior	2.0	1.3	0.2	1.2	4.7	1.6	1.1	0.1	7.5
Justice	2.0	0.3	0.2	0.0	2.6	1.8	2.6	1.2	8.1
NASA	0.2	1.1	1.5	0.0	2.7	6.8	3.0	0.3	12.8
Postal Service	9.3	4.9	0.0	0.2	14.3	12.0	5.0	0.6	32.0
Transportation	0.8	5.9	7.3	0.1	14.1	4.2	1.2	0.0	19.5
Veterans Affairs	0.5	2.5	0.0	0.0	3.2	8.2	15.1	1.3	27.6
Other ^c	3.2	3.3	1.3	0.0	7.7	5.3	2.8	0.6	16.5
Total	43.4	258.6	804.5	6.0	1,112.5	198.9	160.8	73.0	1,545.2
1999^P									
Agriculture	3.5	0.1	0.0	0.1	3.7	2.0	2.1	0.5	8.2
Defense	14.2	151.3	460.9	1.8	628.2	104.1	90.7	32.2	855.4
Energy	1.1	1.2	0.0	0.1	2.4	16.6	7.1	5.0	31.0
GSA	0.1	0.1	0.0	0.0	0.2	10.0	3.4	1.6	15.1
Health and Human Services	0.4	0.3	0.0	0.1	0.9	3.0	3.5	0.1	7.4
Interior	3.0	0.8	0.1	0.7	4.7	1.6	1.5	0.1	7.9
Justice	5.1	0.4	1.6	0.0	7.1	4.0	4.7	0.4	16.2
NASA	0.2	0.4	1.2	0.0	1.9	6.8	3.2	0.2	12.0
Postal Service	11.0	5.3	0.0	0.0	16.2	17.2	7.9	0.6	42.0
Transportation	0.8	6.9	4.6	0.0	12.3	8.2	1.1	0.0	21.6
Veterans Affairs	1.3	1.2	0.0	0.0	2.4	9.9	15.1	1.6	29.0
Other ^d	2.5	3.3	0.9	0.0	6.8	14.0	5.1	0.6	26.5
Total	43.4	171.2	469.2	3.1	686.9	197.5	145.2	42.7	1,072.3

KEY: GSA = General Services Administration; NASA = National Aeronautics and Space Administration; P = preliminary

Continued next page

Table 4-19M
Cont'd**U.S. Government Energy Consumption by Agency and Source (Petajoules)**^a Includes liquefied petroleum gases.^b Includes purchased steam, coal, and other.^c Includes U.S. Department of Commerce, Panama Canal Commission, Tennessee Valley Authority, U.S. Department of Labor, U.S. Department of Housing and Urban Development, Federal Communications Commission, Office of Personnel Management, U.S. Department of State, Small Business Administration, National Science Foundation, U.S. Department of Treasury, and Environmental Protection Agency.^d Includes National Archives and Records Administration, U.S. Department of Commerce, U.S. Department of Labor, U.S. Department of State, Environmental Protection Agency, Federal Communications Commission, Federal Trade Commission, Panama Canal Commission, Equal Employment Opportunity Commission, Nuclear Regulatory Commission, Office of Personnel Management, U.S. Department of Housing and Urban Development, U.S. Department of Treasury, Tennessee Valley Authority, Railroad Retirement Board, U.S. Information Agency, and Federal Emergency Management Agency.

NOTES: Numbers may not add to totals due to rounding. These data include energy consumed at foreign installations and in foreign operations, including aviation and ocean bunkering, primarily by the U.S. Department of Defense. U.S. government energy use for electricity generation and uranium enrichment is excluded. Other energy used by U.S. agencies that produce electricity or enriched uranium is included. The U.S. government's fiscal year runs from October 1 through September 30. This table uses a conversion factor for electricity of 3,600,000 joules per kilowatt-hour, and a conversion factor for purchased steam of 2,326 Kilojoules per kilogram.

SOURCE: U.S. Department of Energy, Energy Information Administration, *Annual Energy Review 1999*, DOE/EIA-0384(99) (Washington, DC: July 2000), table 1.13. Internet site <http://www.eia.doe.gov/emeu/aer/> as of June 27, 2000.

Table 4-20M

Energy Intensity of Passenger Modes (Thousand joules per passenger-kilometer)

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998
Air^R											
Certificated air carrier											
Domestic operations	5,664	6,639	6,682	5,082	3,757	3,311	3,236	2,875	2,744	2,720	2,705
International operations	6,036	6,753	7,208	5,554	5,817	3,348	2,983	2,738	2,695	2,735	2,807
Highway^b											
Passenger car	^R 2,949	^R 2,923	^R 3,176	^R 3,112	^R 2,853	^R 2,800	^R 2,501	^R 2,441	^R 2,429	^R 2,399	2,409
Other 2-axle 4-tire vehicle	N	N	^R 4,468	^R 4,311	^R 3,746	^R 3,261	^R 2,920	^R 2,978	^R 2,992	^R 2,994	3,012
Motorcycle	^a	^a	^R 1,640	^R 1,544	^R 1,394	^R 1,244	^R 1,306	^R 1,461	^R 1,476	^R 1,506	1,529
Transit motor bus	N	N	N	N	^R1,799	^R2,228	^R2,443	^R2,726	^R2,753	^R2,774	^P2,447
Amtrak	N	N	N	^R1,563	^R1,420	^R1,374	1,354	^R1,206	^R1,409	^R1,443	1,403

KEY: N = data do not exist; P = preliminary; R = revised

^a Included in passenger car.^b Energy intensity for highway vehicles may not match similar values in table 4-22 due to rounding error.

NOTE: To calculate total joules multiply fuel consumed by 37,626,700 joules/liter for air carrier and 34,839,537 joules/liter for passenger car, other 2-axle 4-tire vehicle, and motorcycle, and 90,999,114 for transit motor bus and Amtrak.

SOURCES:**Air:***Certificated air carriers:*

Passenger-miles: 1960-99: Air Transport Association, Internet site <http://www.air-transport.org/public/industry>, as of July 5, 2000.

Fuel consumed: 1960-99: U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information, Internet site <http://www.bts.gov/oai/fuel/fuel-yearly.html>, as of July 5, 2000.

Highway:

Passenger car: 1960-90: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995*, FHWA-PL-97-009 (Washington, DC: July 1997), table VM-201A.

1995-98: Ibid., *Highway**Statistics* (Washington, DC: Annual issues), table VM-1.

Other 2-axle 4-tire vehicle: 1970-90: Ibid., *Highway Statistics Summary to 1995*, FHWA-PL-97-009 (Washington, DC: July 1997), table VM-201A.

1995-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

Motorcycle: 1970-85: Ibid., *Highway Statistics Summary to 1985*, FHWA-PL-97-009 (Washington, DC: July 1997), table VM-201A.

1990-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

Transit motor bus:

1980-98: American Public Transit Association, *Public Transportation Fact Book* (Washington, DC: 2000), tables 30, 42, and 65.

Amtrak:

1975-90: Amtrak, State and Local Affairs Department, personal communication.

1995-98: Ibid., Personal communication, June 25, 1999.

Table 4-21M Energy Intensity of Certificated Air Carriers, All Services^a

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998	1999
Aircraft-kilometers (millions)												
Domestic operations	1,381	1,825	3,328	3,135	4,060	4,902	6,378	7,450	7,743	^R 7,904	8,097	8,330
International operations	293	457	764	607	645	668	1,223	1,606	1,679	1,793	1,917	1,926
Available seat-kilometers (millions)^R												
Domestic operations	84,040	152,545	343,048	388,306	556,879	717,489	906,167	971,912	1,008,077	1,030,495	1,045,178	1,105,525
International operations	21,480	47,529	83,622	99,335	139,220	164,094	274,088	326,955	335,842	349,088	361,665	371,613
Passenger-kilometers (millions)^R												
Domestic operations	49,177	83,504	167,609	211,996	322,335	435,464	547,550	635,222	684,932	712,361	733,539	771,986
International operations	13,367	27,019	44,358	50,022	87,489	105,926	189,412	234,881	246,338	258,749	263,379	276,660
Fuel consumed (million liters)												
Domestic operations	7,397	14,721	29,742	28,610	34,432	^R 38,289	^R 47,049	48,499	^R 49,918	51,709	52,530	54,518
International operations	2,143	4,845	8,491	7,378	7,336	^R 9,418	^R 15,002	^R 17,076	^R 17,632	18,791	19,631	19,873
Seats per aircraft^R												
Domestic operations	60.9	83.6	103.1	123.9	137.1	146.4	142.1	130.5	130.2	131.1	129.1	132.7
International operations	73.3	104.0	109.4	163.7	215.7	245.7	224.1	203.6	200.1	194.7	188.7	192.9
Seat-kilometer per liter^R												
Domestic operations	11	10	12	14	16	19	19	20	20	20	20	20
International operations	10	10	10	13	19	17	18	19	19	19	18	19
Energy intensiveness (1000 Joules/passenger-kilometer)^{b, R}												
Domestic operations	5,664	6,639	6,682	5,082	4,022	3,311	3,236	2,875	2,744	2,720	2,705	2,659
International operations	6,036	6,753	7,208	5,554	3,158	3,348	2,982	2,738	2,695	2,735	2,807	2,705
Load factor (%)												
Domestic operations	^R 58.5	^R 54.7	^R 48.9	^R 54.6	^R 58.0	^R 60.7	^R 60.4	^R 65.4	67.9	69.1	70.2	69.8
International operations	^R 62.2	^R 56.8	^R 53.0	54.4	^R 62.8	^R 64.6	^R 69.1	71.8	73.3	74.1	^R 72.8	74.4

KEY: R = revised

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Table 4-21M
Cont'd

Energy Intensity of Certificated Air Carriers, All Services^a

^a U.S. owned carriers only. Operation of foreign-owned carriers in or out of the United States not included.

^b Calculation based on unrounded figures not shown here.

NOTES: Aircraft-kilometers includes all four air-carrier groups (majors, nationals, large regionals, and medium regionals), scheduled and charter, passenger, and all-cargo. Fuel consumed includes majors, nationals, and large regionals, scheduled and charter, passenger, and all-cargo. Passenger-kilometers includes all four air-carrier groups, scheduled and charter, passenger service only. International operations include operations outside the United States, including those between the United States and foreign countries and the United States and its territories or possessions.

Domestic and international load factor values for 1999 are derived by calculation.

Heat equivalent factor used for joules conversion is 37,626,700 joules/liter.

SOURCES:

Aircraft-kilometers, available seat-kilometers, passenger-kilometers, and load factor: 1960-80: Air Transport Association, Internet site <http://www.air-transport.org/public/industry>, as of July 5, 2000.

1985-98: U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information, *Air Carrier Traffic Statistics* (Washington DC: Annual December issues).

Fuel consumed: 1960-99: U.S. Department of Transportation, Bureau of Transportation Statistics, Office of Airline Information, Internet site <http://www.bts.gov/oai/fuel/fuelyearly.html>, as of July 5, 2000.

Seats per aircraft, seat-kilometers per liter, and energy intensiveness: Derived by calculation.

Table 4-22M Energy Intensity of Passenger Cars, Other 2-Axle 4-Tire Vehicles, and Motorcycles

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998
Vehicle-kilometers (millions)											
Passenger car	^R 944,687	^R 1,163,558	^R 1,475,771	^R 1,664,065	^R 1,789,594	^R 2,006,856	^R 2,265,961	^R 2,314,241	^R 2,365,740	^R 2,418,849	2,488,050
Other 2-axle 4-tire vehicle	N	N	^R 197,950	^R 323,479	^R 468,320	^R 629,255	^R 925,375	^R 1,271,384	^R 1,314,836	^R 1,369,554	1,393,695
Motorcycle	^b	^b	4,828	9,012	16,415	14,645	15,450	15,772	15,933	16,254	16,576
Passenger-kilometers (millions)^a											
Passenger car	^R 1,842,702	^R 2,245,039	^R 2,817,967	^R 3,144,664	^R 3,238,006	^R 3,369,973	^R 3,672,530	^R 3,680,577	^R 3,761,044	^R 3,844,730	3,955,775
Other 2-axle 4-tire vehicle	N	N	363,712	^R 584,193	^R 838,470	^R 1,107,231	^R 1,609,347	^R 2,021,340	^R 2,088,932	^R 2,177,446	2,216,071
Motorcycle	^b	^b	4,828	9,656	19,312	19,312	19,312	^R 17,703	^R 17,703	^R 17,703	17,703
Fuel consumed (million liters)											
Passenger car	155,849	188,222	256,723	280,650	264,911	270,725	263,344	257,681	262,030	^R 264,570	273,341
Other 2-axle 4-tire vehicle	N	N	46,610	72,229	90,078	103,580	134,802	172,634	179,254	^R 186,954	191,462
Motorcycle	^b	^b	227	428	772	689	723	742	750	765	776
Energy intensiveness (1,000 Joules/passenger-kilometer)^R											
Passenger car	2,947	2,921	3,174	3,109	2,850	2,799	2,498	2,439	2,427	2,397	2,407
Other 2-axle 4-tire vehicle	N	N	4,465	4,308	3,743	3,259	2,918	2,975	2,990	2,991	3,010
Motorcycle	^a	^a	1,639	1,543	1,393	1,243	1,304	1,460	1,475	1,505	1,527

KEY: N = data do not exist; R = revised

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Table 4-22M
Cont'd

Energy Intensity of Passenger Cars, Other 2-Axle 4-Tire Vehicles, and Motorcycles

^a Passenger-kilometers are derived by multiplying vehicle-kilometers by an average occupancy rate for that vehicle type based on data provided by the Federal Highway Administration, Nationwide Personal Transportation Survey, 1977, 1983, 1995. Average vehicle occupancy rates are as follows: passenger car (1960-97): 1.95, 1.93, 1.91, 1.89, 1.81, 1.68, 1.62, 1.62, 1.61, 1.61, 1.60, 1.59, 1.59, 1.59; other 2-axle 4-tire vehicle (1960-97): 1.87, 1.85, 1.83, 1.81, 1.79, 1.76, 1.74, 1.72, 1.70, 1.68, 1.66, 1.64, 1.64, 1.64; motorcycle (1960-97): 1.1, 1.1, 1.1, 1.1, 1.2, 1.3, 1.3, 1.27, 1.25, 1.23, 1.21, 1.18, 1.18, 1.18.

^b Included in passenger car.

NOTES: In 1995, the U.S. Department of Transportation, Federal Highway Administration revised its vehicle type categories for 1993 and later data. These new categories include passenger car, other 2-axle 4-tire vehicle, single-unit 2-axle 6-tire or more truck, and combination truck. Other 2-axle 4-tire vehicle includes vans, pickup trucks, and sport utility vehicles. In previous years, some minivans and sport utility vehicles were included in the passenger car category. Single-unit 2-axle 6-tire or more trucks are on a single frame with at least 2 axles and 6 tires. Pre-1993 data have been reassigned to the closest available category.

The heat equivalent factor used for joules conversion is 34,839,537 joules/liter.

SOURCES:

Vehicle-kilometers:

Passenger car: 1960-90: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995*, FHWA-PL-97-009 (Washington, DC: July 1997), table VM-201A.

1995-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

Other 2-axle 4-tire vehicle: 1960-90: Ibid., *Highway Statistics, Summary to 1995*, FHWA-PL-97-009 (Washington, DC: July 1997), table VM-201A.

1995-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

Motorcycle: 1970-85: Ibid., *Highway Statistics, Summary to 1985* (Washington, DC: 1986), table VM-201A. For 1970-90, the unrevised motorcycle vehicle-kilometers are subtracted from the combined passenger car and motorcycle vehicle-kilometers from VM-201A.

1990-98 Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

Passenger-kilometers:

Passenger-kilometers multiplied by vehicle occupancy rates.

Fuel consumed:

1960-90: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995*, FHWA-PL-97-009 (Washington, DC: July 1997), table VM-201A. For 1970-90, the unrevised motorcycle fuel consumed is subtracted from the combined passenger car and motorcycle fuel consumed from VM-201A.

1995-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

Table 4-23M Average Fuel Efficiency of U.S. Passenger Cars, Light Trucks, and Light-Duty Vehicles

	1980	1985	1990	1995	1996	1997	1998	1999
Average U.S. passenger car fuel efficiency (kpl) (calendar year)^R								
Passenger car	6.8	7.4	8.6	9.0	9.0	9.1	9.2	9.1
Other 2-axle 4-tire vehicle	5.2	6.1	6.8	7.4	7.3	7.3	7.3	7.3
New vehicle fuel efficiency (kpl)^a (model year)^R								
Light-duty vehicle (passenger cars plus light trucks)								
Domestic	9.1	10.2	10.2	10.1	10.2	9.9	9.9	10.1
Imported	12.2	12.9	12.1	11.9	11.8	11.7	11.7	11.4
Passenger car								
Domestic	9.6	11.2	11.4	11.8	12.0	11.8	11.9	12.0
Imported	12.6	13.4	12.7	12.9	12.6	12.8	12.7	12.1
Light truck (<3,865 lbs GVWR)								
Domestic	7.1	8.3	8.6	8.6	8.7	8.6	8.7	8.7
Imported	10.3	11.3	9.8	9.1	9.4	9.4	9.7	9.6
CAFE standards (kpl)^a (model year)^R								
Passenger car	8.5	11.7	11.7	11.7	11.7	11.7	11.7	11.7
Light truck	6.8/6.0 ^b	8.3	8.5	8.8	8.8	8.8	8.8	8.8

^a Assumes 55% city and 45% highway-kilometers. The source calculated average kilometers per liter for light-duty vehicles by taking the reciprocal of the sales-weighted average of liters per kilometer. This is called the harmonic average.

^b 2 Wheel Drive/4 Wheel Drive. No combined figure available for this year.

NOTE: The fuel efficiency figures for light duty vehicles represent the sales-weighted harmonic average of the combined passenger car and light truck fuel economies.

SOURCES:

Average U.S. passenger car fuel efficiency: 1980-90: U.S. Department of Transportation, Federal Highway Administration, *Highway Statistics Summary to 1995*, FHWA-PL-97-009 (Washington, DC: July 1997), table VM-201A.

1995-98: Ibid., *Highway Statistics* (Washington, DC: Annual issues), table VM-1.

KEY: CAFE = Corporate Average Fuel Economy;
GVWR = gross vehicle weight rating;
kpl = kilometers per liter; R = revised;
U = data are unavailable

New vehicle fuel efficiency (based on model year production): 1980-99: U.S. Environmental Protection Agency, final fuel economy calculations for the U.S. Department of Transportation, National Highway Traffic Safety Administration, as cited in Internet site www.nhtsa.dot.gov/cars/problems/fuelecon/index.html.

1995-99: Manufacturer's preliminary estimates for the U.S. Department of Transportation, National Highway Traffic Safety Administration, as cited in Internet site www.nhtsa.dot.gov/cars/problems/fuelecon/index.html.

CAFE standards: 1980-99: U.S. Department of Transportation, National Highway Traffic Safety Administration, as cited in Internet site www.nhtsa.dot.gov/cars/problems/fuelecon/index.html.

Table 4-24M Energy Intensiveness of Transit Motor Buses

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998
Vehicle-kilometers (millions)	2,536	2,459	2,268	2,456	2,699	2,998	3,428	3,515	3,484	3,713	3,687
Passenger-kilometers (millions) ^R	N	N	N	N	35,084	34,118	33,796	30,256	30,739	32,831	33,157
Fuel consumed (million liters diesel)	787	939	1,026	1,382	1,632	1,961	2,131	2,135	^R 2,184	^R 2,260	2,097
Energy intensiveness (1,000 Joules/passenger-kilometer) ^R	N	N	N	N	1,798	2,222	2,438	2,728	2,747	2,661	2,445

NOTES: Heat equivalent factor used for joules conversion is 38,657,950 joules/liter. APTA changed from American Public Transit Association to American Public Transportation Association in January 2000. The APTA Transit Fact Book changed to the Public Transportation Fact Book in March 2000.

SOURCE: American Public Transportation Association, *Public Transportation Fact Book* (Washington, DC: March 2000), tables 65 and 79, and similar tables in earlier editions of the APTA *Transit Fact Book*.

KEY: N = data do not exist; R = revised

Table 4-25M Energy Intensity of Class I Railroad^a Freight Service

	1960	1965	1970	1975	1980	1985	1990	1995	1996	1997	1998
Revenue freight tonne-kilometers (millions)	^R 835,557	^R 1,018,884	^R 1,116,602	^R 1,101,189	^R 1,341,656	^R 1,280,375	^R 1,509,569	^R 1,906,272	^R 1,979,690	^R 1,969,398	2,010,096
Car-kilometers (millions)	45,335	47,212	48,103	44,508	47,117	40,105	42,099	48,897	51,040	50,952	52,556
Tonnes per car load	40	44	50	55	61	61	60	59	60	57	58
Fuel consumed (million liters)	13,109	13,597	13,419	13,843	14,778	11,773	11,792	13,173	13,548	13,533	13,563
Energy intensiveness (1000 Joules/revenue freight tonne-kilometer)	^R 607	516	465	486	426	355	302	267	265	266	261
Energy intensiveness (1000 Joules/car-kilometer)	11,178	11,134	^R 10,785	12,024	12,125	11,348	10,828	10,415	10,261	10,268	9,977

^a Class I railroads are those that have operating revenues of \$255 million or more.

SOURCE: Association of American Railroads, *Railroad Facts* (Washington, DC: October 1999), pp. 34, 37, and 40.